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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/698,039	10/30/2003	Hidenori Usuda	9319S-000574	1175

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EXAMINER	
MRUK, GEOFFREY S	
ART UNIT	PAPER NUMBER
2853	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/31/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/698,039	USUDA, HIDENORI	
	Examiner	Art Unit	
	Geoffrey Mruk	2853	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 November 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-26* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-26* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 21 November 2006 has been entered.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1 and 14 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claims 1 and 14 recite the limitation "transition between generation of the normal drive signal and generation of the heating drive signal is a switchless operation." The specification, specifically the normal operation of the printer at paragraphs 0066-0070, fails to describe a "switchless operation." As stated in the specification, "the normal drive signal ND is continuously

applied to the piezoelectric elements 30 from the switching circuit 33b of the drive integrated circuit 33, causing the discharge liquid L to be continuously discharged as the droplets D from the discharging apertures 20a toward the object W" (paragraph 0067). Further, "The arithmetic control section 8a monitors the temperature of the discharge liquid L on the basis of the temperature detection signal c received from the temperature detector 33c. If the temperature is below a predetermined threshold temperature, then the arithmetic control section 8a instructs the drive signal generating section 8b to generate the heating drive signal HD and also generates the selection data b calling for the application of the heating drive signal HD to the piezoelectric elements 30 and outputs the generated selection data b to the switching signal generator 33a. As a result, the heating drive signal HD is applied to the piezoelectric elements 30, and the piezoelectric elements 30 are driven in a non-discharge mode (heating drive) at the 100-kHz repetitive frequency f" (paragraph 0069).

Therefore, based on the inadequate specification, one of ordinary skill in the art would not be able to ascertain a "switchless operation" since the signal applied to the piezoelectric elements changes from a normal drive signal to a heating drive signal.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1 and 14 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite in that it fails to point out what is included or excluded by the claim language. This claim is an omnibus type claim. Claims 1 and 14 recite the limitation "transition between generation of the normal drive signal and generation of the heating drive signal is a switchless operation." The terms "transition" and "switchless operation" contradict each other. Therefore, one of ordinary skill in the art would not be able to ascertain the meets and bounds of term "switchless operation", when the "transition" between generation of the normal drive signal and generation of the heating drive signal occurs (paragraph 0072).

For examination purposes, the examiner will treat claims 1 and 14 in their broadest, reasonable interpretation. For claims 1 and 14, the examiner asserts that the broadest, reasonable interpretation is "transition between generation of the normal drive signal and generation of the heating drive signal is an operation."

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

1. Claims 1-7 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Toye (US 4,068,144) in view of Arakawa et al. (US 6,270,180 B1), and in further view of Hertz et al. (US 4,050,075).

With respect to claim 1, the primary reference of Toye discloses a droplet discharging apparatus (Fig. 1) comprising:

- an aperture (Fig. 1, element 18) through which liquid droplets (Column 4, line 45) are discharged by mechanically deforming a piezoelectric element (Fig. 1, elements 10-12) using a normal drive signal (Column 4, lines 34-67; Column 5, line 10).

However, Toye fails to disclose:

- wherein the piezoelectric element is subjected to a heating drive signal of a repetitive frequency when the aperture is positioned in an image forming region, the heating drive signal is insufficient to cause droplets from being discharged through the aperture thereby facilitating heating of the droplets;
- a single waveform generating section that generates both the normal drive signal and the heating drive signal based on data generated by an arithmetic control

section, transition between generation of the normal drive signal and generation of the heating drive signal is an operation;

- an X-direction drive motor that moves the aperture in an X-direction and a Y-direction drive motor that moves the aperture in a Y-direction, the X-direction drive motor and the Y-direction drive motor each in receipt of inputs from the arithmetic control section, which receives setting information generated by a control computer;
- a switching circuit in receipt of at least one of the normal drive signal and the heating drive signal and;
- a switching signal generator in receipt of selection data generated by the arithmetic control section, the selection data designates one of the normal drive signal and the heating drive signal to be applied to the piezoelectric element.

The secondary reference of Arakawa discloses:

- the piezoelectric element (Fig. 4, element 17p) which is subjected to a heating drive signal of a repetitive frequency (Fig. 8b, element 72) when the aperture is positioned in an image forming region (Column 15, lines 30-35), the heating drive signal is insufficient to cause droplets from being discharged through the aperture thereby facilitating heating of the droplets (Column 11, lines 39-63),
- a single waveform generating section (Fig. 1, element 15) that generates both the normal drive signal and the heating drive signal based on data generated by an arithmetic control section (Fig. 1, element 11), transition between generation

of the normal drive signal and generation of the heating drive signal is an operation (Fig. 8);

- a switching circuit (Fig. 1, element 16) in receipt of at least one of the normal drive signal and the heating drive signal and;
- a switching signal generator (Fig. 1, element 23) in receipt of selection data generated by the arithmetic control section, the selection data designates one of the normal drive signal and the heating drive signal to be applied to the piezoelectric element (Fig. 1, element 17).

With respect to claim 2, the secondary reference of Arakawa discloses the heating drive signal is applied to the piezoelectric element immediately before a droplet is discharged by the normal drive signal (Fig. 8e).

With respect to claim 3, the secondary reference of Arakawa discloses the heating drive signal is applied to the piezoelectric element while a droplet is being discharged by the normal drive signal (Column 15, lines 19-27).

With respect to claim 4, the secondary reference of Arakawa discloses the heating drive signal is applied to the piezoelectric element if the temperature of a discharge liquid that is detected by a temperature detecting means drops below a predetermined threshold temperature (Column 9, lines 11-30).

With respect to claim 5, the secondary reference of Arakawa discloses the repetitive frequency of the heating drive signal is 40 kHz or more (Column 15, 30-35).

With respect to claim 6, the secondary reference of Arakawa discloses the amplitude of the heating drive signal is half that or less of the normal drive signal (Column 15, 30-35).

With respect to claim 7, the secondary reference of Arakawa discloses the discharge liquid is a printing ink (Column 6, lines 61-67).

With respect to claim 13, the secondary reference of Arakawa discloses the heating drive signal is applied to the piezoelectric element before, during and after preliminary discharging (Column 15, lines 19-40).

The tertiary reference of Hertz discloses an ink jet method an apparatus where "According to one aspect of this invention there is provided apparatus for X-Y plotting and for making drawings which comprises in combination ink-jet writing means affixed to a traveling carriage, means to sense a function (e.g., velocity or acceleration) of the relative movement between a receptor on which the ink-jet is writing and the carriage on which the ink-jet apparatus is mounted and means to employ that function in the form of a corrective signal to the ink-jet apparatus to control the flow and/or disposition of the ink to maintain a predetermined line width in the plot or drawing" (Column 2, lines 44-54) and "Relative movement between the carriage and receptor may be realized by moving the carriage in both the X- and Y-directions, or by moving the carriage in one of these directions and the receptor in the other. The means of this invention for maintaining predetermined line widths in X-Y plots and mechanical drawings are applicable to all of the known types of ink-jet apparatus" (Column 2, lines 62-67).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to use the heat drive signal disclosed by Arakawa in the inkjet printer of Toye for the purpose of "heating is conducted by the heating signal whose frequency is controlled for each head, it is not necessary to provide any outside fitting part for heating near each head, thereby, a bad influence onto the image, caused by the change of the ink viscosity due to the temperature, can be avoided" (Column 17, lines 50-62) and to use the relative movement between the carriage and receptor disclosed by Hertz in the inkjet printer of Toye "to provide apparatus of the character described which is operated and controlled by electrical signals from a computer or other appropriate source and which is capable of producing lines of highly uniform widths. Still another object of this invention is to provide a plotting and/or drafting apparatus, which is rapid, accurate and readily controlled" (Column 2, lines 24-32).

2. Claims 8-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Toye (US 4,068,144) in view of Arakawa et al. (US 6,270,180 B1), and Hertz et al. (US 4,050,075) as applied to claims 1-7 above, and further in view of Speakman (US 6,503,831 B2).

Toye, Arakawa, and Hertz references disclose all of the limitations of the droplet discharging apparatus except

- the discharge liquid is an electrically conductive material for forming a wiring pattern,
- the discharge liquid is a transparent resin for forming a microlens,
- the discharge liquid is a resin for forming a color layer of a color filter,

- the discharge liquid is an electro-optic material,
- the electro-optic material is a fluorescent organic compound presenting electroluminescence.

Speakman discloses suitable deposition materials using drop on demand printing (Column 44, lines 30-67 and Column 45, lines 1-42), where

- the discharge liquid is an electrically conductive material for forming a wiring pattern (Column 44, lines 30-37),
- the discharge liquid is a transparent resin for forming a microlens (Column 35, lines 8-15),
- the discharge liquid is a resin for forming a color layer of a color filter (Column 35, lines 8-15),
- the discharge liquid is an electro-optic material (Column 2, lines 4-34),
- the electro-optic material is a fluorescent organic compound presenting electroluminescence (Column 44, lines 30-59).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to use the deposition materials disclosed by Speakman in the inkjet printer of Toye. The motivation for doing so would have been "covering hitherto unexplored ideas that will be fuelled by the high degree of processing flexibility that is provided by ink jet printing in electronic, opto-electronic, and optical device manufacture" (Column 2, lines 4-34).

3. Claims 14-20 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Toye (US 4,068,144) in view of Arakawa et al. (US 6,270,180 B1), and in further view of Hertz et al. (US 4,050,075).

With respect to claim 14, the primary reference of Toye discloses a droplet discharging method (Fig. 1) comprising:

- discharging liquid droplets (Column 4, line 45) through an aperture (Fig. 1, element 18) by mechanically deforming a piezoelectric element (Fig. 1, elements 10-12) using a normal drive signal (Column 4, lines 34-67; Column 5, line 10).

However, Toye fails to disclose:

- heating the discharge liquid by subjecting the piezoelectric element to a heating drive signal of a repetitive frequency when the aperture is positioned in an image forming region, the heating drive signal is insufficient to eject the discharge liquid through the aperture, thereby facilitating heating of the droplets;
- generating both the normal drive signal and the heating drive signal using a waveform generating section based on inputs received from an arithmetic control section, transition between generation of the normal drive signal and generation of the heating drive signal is an operation;
- controlling an X-direction drive motor that moves the aperture in an X-direction and a Y-direction- drive motor that moves the aperture in a Y-direction using the arithmetic control section in receipt of setting information generated by a control computer;

- outputting at least one of the normal drive signal and the heating drive signal to a switching circuit; and
- generating selection data using the arithmetic control section and outputting the selection data to a switching signal generator, the selection data designates one of the normal drive signal and the heating drive signal to be applied to the piezoelectric element.

The secondary reference of Arakawa discloses:

- heating the discharge liquid by subjecting the piezoelectric element (Fig. 4, element 17p) to a heating drive signal of a repetitive frequency (Fig. 8b, element t2) when the aperture is positioned in an image forming region (Column 15, lines 30-35), the heating drive signal is insufficient to eject the discharge liquid through the aperture (Column 11, lines 39-63), thereby facilitating heating of the droplets;
- generating both the normal drive signal and the heating drive signal using a waveform generating section (Fig. 1, element 15) based on inputs received from an arithmetic control section (Fig. 1, element 11), transition between generation of the normal drive signal and generation of the heating drive signal is an operation (Fig. 8),
- outputting at least one of the normal drive signal and the heating drive signal to a switching circuit (Fig. 1, element 16); and
- generating selection data (Fig. 1, element 23) using the arithmetic control section and outputting the selection data to a switching signal generator, the selection

data designates one of the normal drive signal and the heating drive signal to be applied to the piezoelectric element (Fig. 1, element 23).

With respect to claim 15, the secondary reference of Arakawa discloses the heating drive is carried out immediately before the normal drive for discharging a droplet (Fig. 8e).

With respect to claim 16, the secondary reference of Arakawa discloses wherein the heating drive is carried out during the normal drive (Column 15, lines 19-27).

With respect to claim 17, the secondary reference of Arakawa discloses wherein the heating drive is carried out if the temperature of a discharge liquid drops below a predetermined threshold temperature (Column 9, lines 11-30).

With respect to claim 18, the secondary reference of Arakawa discloses wherein the repetitive frequency of the heating drive is 40 kHz or more (Column 15, 30-35).

With respect to claim 19, the secondary reference of Arakawa discloses wherein the heating drive is carried out at an amplitude that is half that or less of the normal drive (Column 15, 30-35).

With respect to claim 20, the secondary reference of Arakawa discloses the discharge liquid is a printing ink (Column 6, lines 61-67).

With respect to claim 26, the secondary reference of Arakawa discloses the heating drive signal is applied to the piezoelectric element before, during and after preliminary discharging (Column 15, lines 19-40).

The tertiary reference of Hertz discloses an ink jet method an apparatus where "According to one aspect of this invention there is provided apparatus for X-Y plotting

and for making drawings which comprises in combination ink-jet writing means affixed to a traveling carriage, means to sense a function (e.g., velocity or acceleration) of the relative movement between a receptor on which the ink-jet is writing and the carriage on which the ink-jet apparatus is mounted and means to employ that function in the form of a corrective signal to the ink-jet apparatus to control the flow and/or disposition of the ink to maintain a predetermined line width in the plot or drawing" (Column 2, lines 44-54) and "Relative movement between the carriage and receptor may be realized by moving the carriage in both the X- and Y-directions, or by moving the carriage in one of these directions and the receptor in the other. The means of this invention for maintaining predetermined line widths in X-Y plots and mechanical drawings are applicable to all of the known types of ink-jet apparatus" (Column 2, lines 62-67).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to use the heat drive signal disclosed by Arakawa in the inkjet printer of Toye for the purpose of "heating is conducted by the heating signal whose frequency is controlled for each head, it is not necessary to provide any outside fitting part for heating near each head, thereby, a bad influence onto the image, caused by the change of the ink viscosity due to the temperature, can be avoided" (Column 17, lines 50-62) and to use the relative movement between the carriage and receptor disclosed by Hertz in the inkjet printer of Toye "to provide apparatus of the character described which is operated and controlled by electrical signals from a computer or other appropriate source and which is capable of producing lines of highly uniform widths. Still another object of this

invention is to provide a plotting and/or drafting apparatus, which is rapid, accurate and readily controlled" (Column 2, lines 24-32).

4. Claims 21-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Toye (US 4,068,144) in view of Arakawa et al. (US 6,270,180 B1), and Hertz et al. (US 4,050,075) as applied to claims 14-20 above, and further in view of Speakman (US 6,503,831 B2).

Toye, Arakawa, and Hertz references disclose all of the limitations of the droplet discharging apparatus except

- the discharge liquid is an electrically conductive material for forming a wiring pattern,
- the discharge liquid is a transparent resin for forming a microlens,
- the discharge liquid is a resin for forming a color layer of a color filter,
- the discharge liquid is an electro-optic material,
- the electro-optic material is a fluorescent organic compound presenting electroluminescence.

Speakman discloses suitable deposition materials using drop on demand printing (Column 44, lines 30-67 and Column 45, lines 1-42), where

- the discharge liquid is an electrically conductive material for forming a wiring pattern (Column 44, lines 30-37),
- the discharge liquid is a transparent resin for forming a microlens (Column 35, lines 8-15),

- the discharge liquid is a resin for forming a color layer of a color filter (Column 35, lines 8-15),
- the discharge liquid is an electro-optic material (Column 2, lines 4-34),
- the electro-optic material is a fluorescent organic compound presenting electroluminescence (Column 44, lines 30-59).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to use the deposition materials disclosed by Speakman in the inkjet printer of Toye. The motivation for doing so would have been "covering hitherto unexplored ideas that will be fuelled by the high degree of processing flexibility that is provided by ink jet printing in electronic, opto-electronic, and optical device manufacture" (Column 2, lines 4-34).

Response to Arguments

Applicant's arguments with respect to claims 1 and 14 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Geoffrey Mruk whose telephone number is 571 272-2810. The examiner can normally be reached on 7am - 330pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Meier can be reached on 571 272-2149. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

GSM
1/26/2007

STEPHEN MEIER
SUPERVISORY PATENT EXAMINER